

POSTER PRESENTATION

INDIVIDUAL EXERCISE HABITS OF MEDICAL STUDENTS

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Introduction: Regular exercise has an important role in maintaining active lifestyle. The present study was designed to obtain information about the habitual physical activity of medical students.

Methods: A questionnaire assessing the information about age, sex, exercise performances, and its limitations was sent to 80 medical students studying at fourth year of IA University Najaf Abad Branch, aged 24.2 $\pm$ 0.2(M $\pm$ SEM) during October 2003.

Results: The response rate was 85%. Fifty percent of the students reported to have interest in at least one kind of sports but only 47.8% of them performed exercises. Regular exercise habit was detected among 15.9% of the students. 26% reported participation in exercise activities three or more times a week. Time limitations, inconvenient time schedule were reported as the reasons for inadequate exercise. The students who practiced 1 sport activities professionally were 4.2%. Other remaining participants of the study engaged in many duties at the university mostly for health, recreation, physical fitness or other reasons.

Conclusion: These results reveal poor and inappropriate exercise habits among medical students. An appropriate program for motivation and exercise promotion in this population is recommended.

SU JOK ACUPUNCTURE AND SPORT MEDICINE

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Acupuncture has been practiced in ancient eastern countries for about 3000 years as a traditional form of medicine. This method has been used especially in Martial Arts to treat the injuries. Acupuncture consists of inserting very fine needles at specific points in the skin. It received strong boost in western countries during recent years, especially when the World Health Organization accepted its application in managing of some conditions. Acupuncture like other sciences has been completed and developed during centuries. Several methods of acupuncture were developed to achieve easier to use with less complications, more acceptable by the patients and more effective therapeutic method. Recently other means of acupoint stimulators have evolved, such as laser, electric stimulation, seed, finger pressure and so forth.

One of the newest systems of acupuncture methods that has been developed during recent years is Su Jok (Hand and Foot) acupuncture. In this method only hands and feet are used for treating the problems instead of the whole body. Needles that are used in this method are very thinner and smaller with less depth of insertion in comparison with ancient acupuncture method. The advantages of this method are simplicity, safety and efficacy. It is easy to learn and the speed of response is sometimes dramatic. It employs no forbidden or dangerous points and is suitable for use by paramedics and lay persons for self treatment. The scope of the problems that can be treated by this method is much wider than ancient methods. One of the other many advantages is the possibility of combining this method with western scientific medicine methods and theories to achieve the most appropriate treatment. On the other hand, less painful and more acceptable stimulating methods such as pressure, seed, color, light and heat may be used in this method.

This article will introduce this method.

ACUPUNCTURE AND SPORT MEDICINE

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Introduction: Acupuncture has been traditionally used for managing injuries in eastern countries but still there is

paucity of large randomized control trials of its efficacy in sports medicine. This article reviews the available published scientific researches of acupuncture treatment in field of sport medicine.

Methods: An extensive Medline search was performed covering the period from 1966 to Nov 2003. Medline was searched through Find option and Medical Subject Heading Data base. Acupuncture, sport injuries, athlete injuries, athletic injuries, Traditional Chinese Medicine, has been selected as main keywords. The search was limited to articles featuring human subjects, all languages, review articles and experimental designs. Published letters and commands were excluded. The search was also undertaken using Yahoo and Google search engines and Medline plus with the above keywords to find out any other useful articles. A total of 20 studies were identified for inclusion.

Results: These articles study the role of acupuncture treatment in lateral epicondylitis, patellar tendonitis, plantar fascitis, frozen shoulder, osteoarthritis and some painful conditions,

The article will review and discuss the results of these studies.

MAKING PERSIAN VERSION OF INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE

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Introduction: Sedentary life style and its health burden have been recognized as global problem, but there has not been any measuring instruments for comparable assessment of physical activity in different countries. Between 1997 and 1998, an international consensus group developed International Physical Activity Questionnaires (IPAQ) for cross-national monitoring of physical activity. IPAQ versions in different languages have been developed, but yet, there is no Persian version of it. The purpose of our work was to create Persian version of IPA Questionnaires.

Methods: The International Physical Activity Questionnaire, Short last 7 days self administered format, was selected to be translated into Persian. The translation was made from English version. The questionnaire was translated to Persian by two independent translators. All items were matched to its Persian equivalent according to Persian language and Iranian culture. The activities that were not common in Iran were substituted by its common equivalent activities according to their METS.

After the independent translation, both translators shared their ideas to make a common translation. Back translation from the Persian translation to English was performed with the same method to ensure retaining the concepts and ideas of the questionnaire. The Persian questionnaire was also distributed among twenty medical students and physicians. They were requested to check the property of translation. After that the essential rectification performed to the Persian translation.

Conclusions: The Persian version of IPAQ short last 7 days, self-administered format can be used for national monitoring of physical activity.

PSYCHOLOGICAL STATUS OF FEMALE KARATE ATHLETES IN ISFAHAN

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Introduction: Psychological status of the athletes has been reported to have an important role in athletics performance and prevention of injuries in contact sports. Despite the increase of interest in martial arts among female population, there is paucity of studies investigated the psychological status of female martial arts athletes.

This study was conducted to determine psychiatric status of female Karate athletes in Isfahan region.

Methods: Forty-nine female Karate athletes aged 19.9 ± 0.7 (M $\pm$ -SEM) practicing Shitorio Karate in different clubs in Isfahan during autumn 2003 were included. They completed the Persian version of symptom check-list - 90 revised test (SCL - 90 R). Row score and T score were calculated. Psychiatric profile of the athletes were determined and compared with normal profile.

Results: The athletes had the score 15.20 ± 1.40 in Somatization scale, 12.70 ± 1.10 in Obsessive Compulsive, 8.53 ± 0.89 in Interpersonal Sensitivity, 12.20 ± 1.50 in Depression, 8.10 ± 1.05 in Anxiety, 7.20 ± 0.83 in Hostility, 3.80 ± 0.60 in Phobic Anxiety, 7.83 ± 0.55 in Paranoid and 6.32 ± 0.86 in Psychotism scales respectively. Row score in different scales was lower than the same normal population. Psychological profile of the athletes had a shape with normal profile.

Conclusion: In this study athletes had normal shape psychiatric profile with the scores lower than normal in different scales. This means no disturbance in psychological status of the studied population. Psychological assessment of the

athletes may be a useful tool for program and policy decisions.

ACUPUNCTURE FOR ANKLE SPRAIN

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Ankle sprain is one of the most frequent sport injuries. It can cause pain, swelling and limitation of movement in ankle joint. Conventional western medicine approach to ankle sprain includes rest, medication, brace, and surgical intervention in some severe cases, physical therapy and rehabilitation programs. The objective of all these modalities is to improve symptoms and signs of the patient and restore the anatomy and function of the ankle joint and to prevent recurrent injuries.

Acupuncture has been traditionally used in eastern countries for managing sport injuries. In traditional Chinese medicine the symptoms and signs of ankle sprain such as pain and swelling is known as Bi syndrome or painful obstruction. Bi syndrome is the result of circulatory obstruction of vital energy (in Chinese called Chi) and blood in energy channels (Meridians) in the body. This maybe caused by trauma such as sprain of the joint. Acupuncture focuses on expelling the pathogenic factors in the channels and eliminating the Chi and blood stagnation in the ankle region. There are several modalities in acupuncture for achieving this goal. Stimulation of local acupoints on the leg including SP5, GB40, ST41, BL60, and the adjacent points: K17, GB37, St36, by needle, electricity or pressure can be useful. Maxibustion (a method of warming) of the ankle region can also be used 12-24 hours after sprain to increase the circulation and break up the Chi and blood stagnation.

In conclusion acupuncture as complementary method can be used with conventional western medicine to minimize the duration of treatment and to enhance better outcomes in ankle sprain.

APPLICATION OF SU JOK ACUPUNCTURE IN SPORT MEDICINE

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Acupuncture has been practiced in ancient eastern countries for about 3000 years as a traditional form of medicine. This method has been used especially in Martial Arts to treat the injuries. Acupuncture consists of inserting very fine needles at specific points in the skin. It received strong boost in western countries during last years, especially when the World Health Organization accepted its application in managing some conditions.

Acupuncture like other sciences have been completed and developed during centuries. Several methods of acupuncture were developed to achieve easier to use with less complications, more acceptable by the patients and more effective therapeutic method. Recently other means of acupoints stimulators have evolved, such as laser, electric stimulation, seed, finger pressure and so forth.

One of the newest systems of acupuncture methods that have been developed during last years is Su Jok (Hand and Foot) acupuncture. In this method only hands and feet are used for treating the problems instead of whole body. Needles that are used in this method are very thinner and smaller with less depth of insertion in comparison with ancient acupuncture method. The advantages of this method are simplicity, safety and efficacy. It is easy to learn and the speed of response is sometimes dramatic. It employs no forbidden or dangerous points and is suitable for use by paramedics and ordinary people for self-treatment. The spectrum of the problems that can be treated by this method is much wider than ancient methods. One of the other most advantages is the possibility of combining this method with western scientific medicine methods and theories to achieve the most appropriate treatment. In the other hand, less painful and more acceptable stimulating methods such as pressure, seed, color, light and heat may be used in this method.

This article will introduce and discuss some facts about this method.

HEADING: YES OR NO?

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Soccer is one of the most popular sports in the world. One of the unique techniques that is used in soccer is using the head for directing the ball. This may cause face, head and neck injuries in soccer players. This article reviews heading and its related injuries.

Recent studies suggest that heading may cause concussion, this hypothesis was raised when the investigators found out the symptoms and signs of concussion including headache, neck pain, dizziness, irritability, insomnia, hearing disturbances and weakened memory reported by soccer players after ball heading in a study. The risk and severity of heading injuries are related to impact force of the ball and consequent acceleration of player's head, so incorrect body position and technique of heading might lead to head injuries.

Heading has been also reported to have chronic impacts such as neuropsychological effects. Electroencephalographic (EEG) abnormalities have been reported in soccer players. Neurodiagnostic findings of ventricular changes, brain atrophy and MRI changes has also been reported in soccer players but more studies are needed to show that these are the results of heading.

Although heading and its effects on soccer players need more investigation, considering the following recommendations may reduce the risk of induced heading injuries. Educating the athletes and coaches about the hazards of incorrect heading, using correct technique of heading, revising the referee rules for protecting athletes from head injuries by ball are essential. Protective supplies such as helmet are under investigation and may reduce the risk of heading in future.

This article will discuss the issue in details.

THE ROLE OF ACUPRESSURE IN CONTROLLING FATIGUE IN ATHLETES

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Introduction: Many athletes may experience fatigue, the state of weariness following a period of exertion, characterized by a decreased capacity for work and reduced efficiently to respond to stimuli. Fatigue can have negative effect on performance and may predispose athletes to sports injuries. Acupressure, the traditional Chinese therapeutic massage has been reported to have good results in reducing fatigue in other populations. The purpose of this study is to determine the role of acupressure, in controlling fatigue in athletes.

Methods: The study population is ninety male and female moderate to severe intensity sports (Martial Arts, Bodybuilding, Basketball, Soccer) athletes randomly divided into three groups. Acupressure group receives acupressure massage three times a week for four week. Acupoint selected for fatigue are Yanglinchnan (GB34). Sanynjiao (SP6), Zusanli (St 36) and Yangchnan (K1). The placebo group receives massage at locations with no acupoints at same frequency as the experiment group. Third group receives no massage. Piper Fatigue Scale (PFS) is used to assess the pretest and post test fatigue. The data will be analyzed by SPSS soft ware with appropriate statistical methods.

The study is still ongoing.

HEALTH BENEFITS OF WING TSUN KUNG FU

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Tendency to martial arts is growing during recent years. Most of the people looking for a safe and scientific martial arts not only for self defense but also for physical and mental health and fitness. Wing Tsun Kung Fu is one of the martial arts systems that is famous for covering all of these aspects together. This style is an ancient branches of the southern Chinese martial arts developed over hundred of years. Most martial arts are based on a lot of fixed techniques but Wing Tsun uses minority but alive and reflex like techniques based on few principles. Wing Tsun is not only for self defense, but is well known method for its positive effects on physical and mental health for peaceful life.

The main concept of Wing Tsun is flexibility in movement. The techniques used in Wing Tsun have offensive and defensive characters simultaneously. Wing Tsun training program consist of three main exercises including practicing forms, Lat Sao and Chi Sao. Chi Sao or „sticky hands” practice is the unique exercise program that is practiced in Wing Tsun. Practicing Chi Sao needs complete relaxation of body and mind. It helps to coordinate body parts. For practicing Chi Sao you need to empty your mind from any unwanted idea in order to relax your body and mind.

All of the above mentioned practices can increase coordination, self confidence, awareness and have positive effects on physical and mental fitness. These have stress relief effects and make the Wing Tsun practioner psychologically ready for daily life.

This article will discuss these issues in detail.

IMPROVEMENT OF BOTH AEROBIC AND ANAEROBIC CAPACITY AFTER TRAINING CONSISTING BY SUPRAMAXIMAL EXERCISES

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The aim of the study was to evaluate the changes in the level of aerobic and anaerobic capacity after training realized by supramaximal effort.

Material and methods: Twenty students from the Academy of Physical Education participated in the study, and were divided into two groups: M10 ($n = 9$, age 22.2 ± 1.8 years, body weight 178.1 ± 6.5 cm, body mass 77.8 ± 10.5 kg) and M5 ($n = 11$, age 22.5 ± 0.9 years, body height 180.7 ± 7.6 cm, body mass 78.0 ± 11.1 kg). The participants from both groups participated in 4 weeks training (4 times a week). Exercises were performed on the cycloergometer Monark 824E connected to the computer which was supplied with "MCE v. 4.0" software. A single training session covered 5 supramaximal sprints during which the study participants performed: first sprint of 100% of the work pre-defined in the Wingate test with a load of 7.5% of the body weight (group M10 – 19.36 ± 2.58 kJ with the load of 10.0% BW, group M5 – 19.16 ± 2.30 kJ with the load of 5.0% BW) and in the remaining four sprints – 50% of the work. There were 2-minute breaks between the sprints. The PWC₁₇₀ test and Wingate test were performed on Monday before the initial training, during four weeks of training and for two weeks after conditioning. In order to compare the study results, the ANOVA variance analysis was used with repeated measurements. The significant level of the differences between the mean values was evaluated post hoc – with the LSD test. All calculations were made using the STATISTICA™ programme (v. 5.5, StatSoft, USA).

Results: Aerobic capacity measured by the PWC₁₇₀ test underwent significant improvement in the M10 group by 8.5% and a not significant increase by 5.1% in group M5 after 4 weeks of training. The highest values of PWC₁₇₀ index were observed in both groups (M10 11.7% and M5 11.5%) after two weeks of deconditioning period. The maximal power measured by Wingate test increase significantly ($p < 0.05$) in group M10 from 10.39 ± 0.71 to 10.72 ± 0.70 W/kg (3.2%) after first week of detraining. In group M5 $P_{\max}$ was changed from 10.69 ± 0.64 to 11.04 ± 0.60 W/kg (3.4%). For average power (P_a) the highest significant changes were observed from 8.31 ± 0.59 to 8.85 ± 0.56 W/kg in M10 (6.6%) and from 8.22 ± 0.51 to 9.01 ± 0.51 W/kg in M5 (9.6%) after first week of deconditioning period. Mean values of PWC₁₇₀ index, $P_{\max}$ and P_a were not significantly differ between groups M10 and M5.

Conclusion: Both types of training significantly improvements both aerobic and anaerobic capacity. No significant differences between the groups were noticed with respect to all the values measured.

PHYSIOLOGICAL CHARACTERISTICS OF AMATEUR LONG-DISTANCE RUNNERS AGED 20-50

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Most often used endurance tests describe the level of aerobic efficiency measured as VO_2max . In case of amateur long-distance runners VO_2max is one of the most important (but not the only one) parameter aiming success in sport. Endurance test should also characterize many other physiological indicators. One of such parameters is anaerobic threshold above which metabolic acidosis and variations in gas exchange appear.

The aim of this study was to define changes in the level of selected physiological indicators in amateur long-distance runners aged 20-50. Observed changes were analyzed on the base of linear modifications of endurance parameters, anaerobic metabolism threshold and maximal values gained in the test.

The material for the study were the results of physiological examinations conducted among forty long-distance runners of different ages. All of them participated in directed endurance training for 30-90 minutes 4-5 times a week. Circulatory and respiratory changes were monitored with physiological appliance "Start 2000" in "breath after breath" process. All obtained results were elaborated with basic statistic methods. Achieved results let the authors conclude:

1. The amount of performed effort and anaerobic metabolism threshold was the main parameter which differentiated examined groups. It evidently showed the differences of endurance in subjects, because it took increasing physical load into account.

2. Conducted examinations can be helpful in establishing criterion of morphological and physiological

preparations of amateur long-distance runners, as well as, possibilities of gaining good results in competitions by them.

References

1. Gabrys T. Wydolność beztlenowa sportowców. Trening – wspomaganie. AWF, Katowice, 2000.
2. Żołądź J. Dynamika zrastania intensywności z uwzględnieniem wpływu przekroczenia progów metabolicznych. Roczniki Naukowe XXV, AWF, Kraków, 1992.
3. Raczek J. Ocena efektów wieloletniego treningu wytrzymałościowego w świetle dynamiki wysiłkowych przemian tlenowo-beztlenowych. *Sport Wyczynowy* 1984; 10: 13.

AN ASSESSMENT OF THE INFLUENCE OF BODY DEHYDRATION AND SUDDEN WEIGHT LOSS ON MARTIAL ARTS COMPETITIVE PERFORMANCE

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The aim of the research: was to examine the consequences of body dehydration as a result of physical intensive effort and to study the influence of deliberate water loss before competition on performance, and also to investigate physical condition after making the weight before martial arts competitions (in particular judo and wrestling).

Materials and methods: The group which was observed consisted of 42 contestants from 7 clubs, selected at random from clubs in Poland. They were competing in groups between 13 – 17 years old boys and girls. All the samples were experienced and successful sportsmen and women. The observed results related to the period of time during the start of competition – the time before beginning the contest.

Results: Most young contestants try to make the weight before starting competition in martial arts. The main aim of this procedure is to gain an advantage by starting in a lower weight-category. But, in fact efficiency, contrary to all expectations, is reduced and we can observe health problems.

Conclusions: Analysis of the physical symptoms shows that the procedure of making the weight by young competitors has an unfavourable influence on their general condition and on their further physical progress.

References

1. Beckers J, Rehner N J. Opróżnianie żołądka z płynów a wysiłek fizyczny. *Med Sport* 2000; 4(1).
2. Gleeson M, Greenhaff P L, Leiper J B. i wsp. Odwodnienie, nawodnienie i wysiłek w gorącym otoczeniu. *Med Sport* 2001; 5(2).
3. Traczyk WZ. Fizjologia człowieka z elementami fizjologii stosowanej i klinicznej, PZWL 2003.
4. Woda mineralna jako napój uzupełniający niedobór płynów ustrojowych. *Med Sport* 1999; 3(1).

DYNAMICS OF OXYGEN CONSUMPTION DURING HIGH INTENSITY EXERCISE IN YOUNG TRAINED BOYS

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Introduction: Anaerobic performance in children is distinctly lower than in adolescents and adults (1), and continuously increases through-out the various growth and maturation stage, reaching peak levels in the second or third decade of life. Anaerobic performance during growth is strongly correlated with lean body mass, peak power and mean power increased during adolescence. The exact qualitative characteristics that are responsible for the relatively low anaerobic performance of the prepubescent child are not clear. It is known that one of the major factor influencing the lower anaerobic performance in children is small activity of muscle glycolytic enzymes proportional to age (anaerobic glycolysis is limited in children because of the low concentration of the phosphofructokinase in their muscles) (2, 3). It is suggested that children can quickly adapt their oxidative metabolism to meet the higher energy requirements and hence, have a lower need for nonoxidative metabolism in the short-term, high-intensity exercise.

The aim of this study was to examine:

- oxygen uptake dynamics during high intensity exercise, and
- oxygen uptake in short exercise and $\dot{V}O_{2\max}$ in maximal work to exhaustion.

Materials and methods: Twenty two healthy boys 11 years old (n=10) and 13 years old (n=12) trained soccer

volunteered for this study Each subject performed 30s Wingate Test. During this test we measured VO_2 , VCO_2 and HR in every 5s period using the expiratory gas analyser K4 b² of Cosmed, and then we compared it with $\dot{\text{V}}\text{O}_{2\text{max}}$ in the maximal work. Ethical Committee of Scientific Researches at the Medical University of Gdansk approved this study.

Results and discussion: The obtained data showed that during the high-intensity exercise VO_2 uptake was significantly faster in younger than in older boys. We have also shown the VO_2 responses at the onset of maximal exercise with tendency for younger boys to have faster VO_2 peak and the greater initial increase in VO_2 .

The oxygen uptake peak ($\text{VO}_{2\text{peak}}$) in 30sec of exercise was in 11-yr and 13-yr boys 53,2 and 48,1 [$\text{ml}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$], respectively. The percentage of $\dot{\text{V}}\text{O}_{2\text{max}}$ in 11-yr and 13-yr boys was 95% and 87%, respectively. Data from other studies (Williams et al. 2001, Hebestreit et al. 1998) supported our results.

References

1. Armon Y, Cooper DM, Flores R. et al. Oxygen uptake dynamics during high-intensity exercise in children and adults. *J Appl Physiol* 1991; 70: 841–8.
2. Erikson BO, Saltin B. *Acta Ped Belg* 1974; 28: S257–S65.
3. Fournier M, Ricci J, Taylor AW. et al. Skeletal muscle adaptation in adolescent boys: sprint and endurance training and detraining. *Med Sci Sport Exerc* 1992; 14: 453–6.
4. Hebestreit H, Kriemler S, Hughson L, Bar-Or O. *J Appl Physiol* 1998; 85: 1833–41.
5. Williams CA, Carter H, Jones AM, Doust JH. *J Appl Physiol* 2001; 90: 1700–6.

REMOTE RESULTS IN TREATMENT OF PATIENTS WITH MULTIPLE INJURIES AS A RESULT OF RECREATIONAL MOTORCYCLE SPORT ACTIVITIES

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The aim of the study was analysis of remote results of treatment of patients with multiple injuries as results of motorcycle accidents. The analysis was focused on aspect of biological disability, and biological detriment of patients' health with consideration to injuries of individual body's parts.

Material: comprised 658 patients treated with success due to multiple injuries in years 1989-1998.

Methods: In prospective study, a severity of injuries was analyzed on the basis of LSO (Injury Numerical Scale) by Brongel. After that, in control research, executed minimally during two years after complete finish of treatment, biological disability and biological detriment of patients' health was determined (average 4,4 years).

Results: Multiple injuries as a result of motorcycle accidents were found in 22 (3,3%) patients. Among them were 20 (90,9%) males and 2 (9,1%) females. Mean age in whole group was 23,4 years. Mean severity of injuries based on LSO was 7,8 points. Examined patients sustained 45 injuries of different body's parts. Injuries of at least two bodies parts was found in 17 (72,2%) of patients and injuries of at least three bodies parts in 5 (22,8%) of patients. The most of injuries concerned to lower limbs – 15 (68,1%) patients, LSO in this group was 3,8 points, upper limbs – 13 (59,0%) patients, LSO in this group was 3,6 points, the last group was head and neck injuries – 9 (40,9%) patients, LSO in this group was 4,0 points. 5 (22,7%) patients had open fractures and 5 (22,7%) had accident after consumption of alcohol drink. The biological disability and biological detriment of patients health was affirmed in all of patients. Mild level of disability was found in 18 (81,8%) patients, moderate in 3 (13,6%), and severe in 1 (4,5%) patient. Mean biological detriment of patients' health in whole examined group was 27,4%. In group of patients with severe head injuries mean detriment of patients health was 50% to 60% and their level of disability was moderate. Severe level of disability and detriment of patients' health (80%) was examined in one patient with backbone fracture and permanently paresis of lower limbs.

Conclusions:

1. Motorcycle accidents concern to small group of patients with multiple organ injuries, but concern to very young people.
2. Injuries mostly concern to lower and upper limbs and head.
3. They always cause biological disability, mostly in mild level and biological detriment of patients' health reaching 30%.

CARDIORESPIRATORY REACTIONS AND ENERGY EXPENDITURES OF WINDSURFERS DURING CYCLE ERGOMETER AND WINDSURFING

SIMULATOR'S TEST EXERCISES

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The aim of the study: comparative analysis of windsurfer's cardiorespiratory reactions and energy expenditures under cycle ergometer's and windsurfing simulator's test exercises.

Materials and methods: The study was carried out in APE&S (Gdansk). In research took part 11 different performance Polish windsurfers performing cycle ergometer's windsurfing simulator's test exercises with stage raising power till exhaustion. For Heart Rate (HR) registration was used the Polar Sport Tester. $\dot{V}E$, $\dot{V}O_2$, $\dot{V}CO_2$, $\dot{V}E/\dot{V}O_2$ and $\dot{V}O_2/HR$ determination was made by using of a portable metabolimeter "Cosmed". Statistic analysis included determination of Means (SD), correlation coefficient (r) and reliable difference between identical indexes by t-Student criterion (p) and by Z_a -criterion of symbols.

Results: The close correlation between the corresponded studied indexes under work power at HR of 170 bpm (as the conditional level of the anaerobic threshold) during cycle ergometer's and windsurfing simulator's test exercises was revealed. However the indexes of absolute critical power and relative critical power during windsurfing simulator's test exercise were significantly lower as compared to those observed during cycle ergometer's test exercise. Similar situation was noted under critical work power. But, in this case close correlation between relative critical power indexes was absent. The results of the study are testify about substantial and a different energy "cost" of windsurfers work at identifiable Heart Rate under cycle ergometer's and windsurfing simulator's test exercises. Most significant energy expenditures in elite windsurfers at Heart Rate of 170 bpm during 40 min exercise are achieved 2500 kkal. But during cycle ergometer's test this index is above always.

Conclusion: The results of the study permit to reveal correspondence of the data received during windsurfing simulator's and cycle ergometer's test exercises and to make a respective corrections in their interpretation for objective estimation of windsurfers functional performance.

PHYSICAL ACTIVITY AND DIETARY HABITS IN MEN WITH CORONARY ARTERY DISEASE PARTICIPATING IN CARDIAC REHABILITATION PROGRAM

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Regular physical activity and proper diet play an important role in secondary prevention of cardiovascular diseases.

The aim of the study: The purpose of this study was to assess physical activity and dietary habits among men with coronary heart disease participating in cardiac rehabilitation program.

Material and methods: The study was conducted in the group of 87 men after myocardial infarction (MI) including 30 men mean age $56,7 \pm 7,2$ years participating $7,0 \pm 2,9$ years in cardiac rehabilitation (CR) program (Group A) and 57 men mean after MI age $58,9 \pm 2,3$ years but without CR. Physical activity was assessed by the interviewer-administrated Seven Day Physical Activity Recall Questionnaire. Diet was assessed by 24-hours food recall.

Results: There was no significant differences in total weekly energy expenditure group A comparing with group B ($20880,3 \pm 3790,8$ kcal/week $19756,6 \pm 3174,4$ kcal/week, $p > 0,05$). Patients from group A had higher reported number of hours spent on moderate types of physical activity including sport activities. Even after excluding 2 hours a week for rehabilitation training, patients from group A spent $4,9 \pm 3,4$ hours/week vs $0,6 \pm 0,8$ hours/week in group B on moderate intensity training. More than 60% of patients from group B reported 0.0kcal/week energy expenditure on leisure time sport activities. The proportion of moderate energy expenditure in mean total weekly energy expenditure (kcal/kg/week) was 14,9%. The proportion of moderate energy expenditure on sport activities in mean total weekly energy expenditure (kcal/kg/week) was 9,1% in group A vs 0,8 % in group B ($p < 0,001$). There was no difference in total daily caloric intake between groups ($2913,0 \pm 679$ kcal/day vs $3153,3 \pm 462,8$ kcal/day, $p > 0,05$). The mean percentage of energy from proteins was 19,6% in group A vs 18,3% in group B ($p > 0,05$), fats was 31,6% in group A vs 34,4% in group B ($p < 0,05$), carbohydrates was 48,8% in group A vs 47,3% in group B ($p > 0,05$). Moreover the mean intake of cholesterol was $339,0 \pm 90,0$ mg in group A vs $582,6 \pm 233,9$ mg in group B ($p < 0,001$).

Conclusions: Cardiac rehabilitation improves frequency, duration and intensity of leisure-time physical activity among men with coronary heart disease. But energy and nutrients intake in this group did not meet the level recommended by experts in prevention of cardiovascular diseases. More attention need to be paid to dietary habits among men with coronary artery disease participating in cardiac rehabilitation programs.

OXIDATIVE STRESS AND ANTIOXIDANT DEFENCE SYSTEM IN HEALTHY, ELDERLY MEN. THE RELATIONSHIP TO PHYSICAL ACTIVITY

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The aim of this study was to determine differences in selected markers of oxidative stress and antioxidant system in the two groups of men aged 65 or more, differing in the level of their physical activity.

Methods: Thirty-one community-dwelling healthy, elderly men (mean age 73.4 ± 6.1 years) with a good nutritional status participated in this study. The Caltrac accelerometer was used to estimate energy expenditure related to physical activity. Subjects were divided into two groups according to the criteria proposed by Bauman: less active (< 1600 kcal/week) and more active (> 1600 kcal/week). In all men, plasma total antioxidant status (TAS), thiobarbituric acid reactive substance (TBARS) and hydrogen peroxide (H_2O_2) concentrations were determined. The reduced glutathione (GSH) content and glutathione peroxidase (GPx) activity in hemolyzed red blood cells were also measured.

Results: There were no significant differences in plasma TAS and H_2O_2 concentrations and in the activity of GPx in red blood cells between less and more active men. In the group of more active subjects, red blood cell levels of GSH were higher while plasma TBARS concentrations were lower in comparison with the group of less active men ($P < 0.05$). Negative correlation between GSH and TBARS levels was ascertained ($r = -0.71$; $p < 0.01$), and GSH concentrations positively correlated with the level of physical activity ($r = 0.63$; $p < 0.05$).

Conclusions: The obtained results suggest the relationship between the level of physical activity and antioxidant defense system and radical generation in elderly men.

DIFFERENCES BETWEEN HEALTHY WOMEN AND MEN IN THE RESISTANCE OF THEIR ERYTHROCYTES TO POLYENE ANTIBIOTIC AMPHOTERICIN B

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The aim of the study: In the present study, the response to polyene antibiotic amphotericin B (AmB) of fresh and stored erythrocytes from healthy women and men was investigated.

Materials and methods: The experiments were performed on fresh human capillary vessel blood and on erythrocytes from venous blood of adult volunteers stored as erythrocyte concentrate for 1 to 50 days after venipuncture. The subjects were divided into three groups: A. men, age 22-46 (mean 30.0 ± 8.67 years old), B. women, age 20-37 (mean 24.8 ± 5.64 years old), C. women, age 50-71 (mean 54.7 ± 6.03 years old). The light absorbance changes of erythrocyte suspension treated with AmB were monitored with a spectrophotometer Epoll 2000 Eco at $\lambda = 590$ nm. The resistance of erythrocytes to the antibiotic was evaluated as AmB concentration that causes 50% hemolysis (C_{50}) during 30 minutes of incubation.

Results: Significantly higher resistance to AmB (C_{50}) is found in erythrocytes of women, compared to men erythrocytes. The mean C_{50} of women of older age group does not differ significantly from that calculated for young age group of women. However, deviation of the resistances from the mean value is much higher in the women of the lower age group, compared to the older age group of women. The resistances to AmB of women as well as men erythrocytes are not correlated with their osmotic fragility. The resistance of erythrocytes to AmB-induced hemolysis is decreased with the time of erythrocyte storage.

Conclusion: Our results suggest that higher resistance to AmB of women erythrocytes is not probably the result of blood loosing and increase in reticulocyte number due to menstrual cycle (1). The resistance is not dependent also on osmotic fragility of erythrocytes. It can not be excluded that difference between women and men are the effect of hormone influence on erythrocyte membranes in women (2).

References

1. Mercke C, Lundh B. Erythrocyte filterability and heme catabolism during the menstrual cycle. *Ann Inter Med* 1976; 85: 322-4.
2. Durocher J, Weir M, Lundblad E. Effect of oral contraceptives and pregnancy on erythrocyte deformability and surface charge. *Proc Soc Exp Biol Med* 1975; 150: 368-70.

CHANGES IN LIPID PROFILE OF POLISH NATIONAL TEAM MEN VOLLEYBALLIST DURING EIGHT MONTHS TRAINING PERIOD

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The aim of the study was to observe the changes in lipid profile parameters in serum of 10 volleyballist in different stages of training period.

Methods: Four times during eight months of training measurements of total cholesterol (CHO), HDL cholesterol (HDL) and triacylglycerols (TRG) concentration in serum were carried out, concentration of LDL cholesterol (LDL) was evaluated using Friedewald formula.

Results: During observation there were significant changes ($p < 0,05$) in CHO, LDL and HDL concentration. No significant changes observed in TRG concentration.

Conclusions: Results of the present study suggest that during long training period appears significant changes of some parameters in lipid profile.

References

1. Bluher M, Hentschel B, Rassoul F, Richter V. Influence of dietary intake and physical activity on annual rhythm of human blood cholesterol concentrations. *Chronobiol Int* 2001; 18: 541–57.
2. Couillard C, Despres JP, Lamarche B. et al. Effects of endurance exercise training on plasma HDL cholesterol levels depend on levels of triglycerides. *Arterioscler Thromb Vasc Biol* 2001; 21: 1226–32.
3. Kraus WE, Houmard JA, Duscha BD. et al. Effects of the amount and intensity of exercise on plasma lipoproteins. *N Engl J Med* 2002; 347: 1483–92.
4. Matthews CE, Freedson PS, Herbert JR. et al. Seasonal variation in household, occupational, and leisure time physical activity: longitudinal analyses from the seasonal variation of blood cholesterol study. *Am J Epidemiol* 2001; 153: 172–83.

CHANGES WITH AGE IN THE AEROBIC FITNESS IN FORMER ELITE OARSWOMEN AND FEMALE KAYAK PADDLERS

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The aim of the study: Several studies have described a decline with age of the maximal physical performance in the untrained women and in female master endurance athletes (1, 2). There is, however, no data available on the effect of age on the cardiorespiratory fitness in former highly strength-endurance trained women athletes. Consequently, the purpose of this study was to elucidate the rate of age-related decline in aerobic fitness in former elite oarswomen and female kayak paddlers.

Methods: Sixteen, healthy, former highly trained oarswomen and female kayak paddlers, members of the Polish National Team, aged 32–65 years, at present moderately physically active participated in this study. The subjects performed graded bicycle exercise until volitional exhaustion. Maximal oxygen uptake $\dot{V}O_{2\max}$, oxygen uptake ($\dot{V}O_{2AT}$) and power output (P_{AT}) at 4 mmol·l⁻¹ LA were determined.

Results: The $\dot{V}O_{2\max}$, $\dot{V}O_{2AT}$ and P_{AT} values declined with age at an average yearly rate of 0.69 ml·kg⁻¹·min⁻¹ ($r = -0.81$, $p < 0,01$), 0.47 ml·kg⁻¹·min⁻¹ ($r = -0.74$, $p < 0,01$) and 0.041 W·kg⁻¹ ($r = -0.73$, $p < 0,01$) respectively.

Conclusion: The aerobic fitness of the subjects was well above the average reported for nonathletes of the same age in the Polish population (2). The rates of age-related decline of $\dot{V}O_{2\max}$, $\dot{V}O_{2AT}$ and P_{AT} were higher than those recorded for moderately active former elite oarsmen in our previous study (3). The rate of decline in $\dot{V}O_{2\max}$ with age was also higher from the values reported for sedentary and endurance trained women (1,2).

References

1. Buskirk ER, Hodgson JL. Age and aerobic power: the rate of change in men and women. *Fed Proc* 1987; 46: 1824–9.
2. Cempla J, Szopa J. Decrease of maximum oxygen consumption in men and women during the fourth to sixth decades of life, in the light of cross-sectional studies of Cracow population. *Biol Sport* 1985; 2: 45–59.

3. Ładyga M, Faff J. Changes with age in the aerobic fitness in former highly trained oarsmen and paddlers. 2nd International Scientific Conference Kinesiology for the 21st century", Dubrovnik, Proc. Book, 1999; 194-6.

ADAPTATION CHANGES UNDER SIMULATED DIVE CONDITIONS (6 ATA)

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Aim of the study: Physical factors of hyperbaric conditions significantly influence physiological reactions of human organism. Increased density of breathing factor influence breathing mechanics and indirectly cardiovascular system. Hyperbaric conditions exert greater pressure on the body surface which can modify skin circulation. Changes in all systems are transferred on the human organism as a whole, leading to adaptive changes. It is reflected in the central function of nervous system, which can be observed in modification of the eye movement. The most representative for brain function is saccadic eye movement. The aim of this study was to assess adaptive changes under 50 m of simulated dive conditions.

Material and methods: In this study participated 22 volunteers aged 23 –31 yrs. They underwent simulated dive conditions of 6 ATA (equivalent of 50 m depth). Baseline recording was performed directly before the dive (in the hyperbaric chamber). During the dive the following parameters were registered: ECG, oculographic eye movements ("Jazz" IR oculograph) and partial pressure of O₂ and CO₂ in skin microvascular circulation from the forearm (PeriFlux – Laser Doppler Flowmeter, Perimed Sweden). For the saccadic eye movement analysis the Dsf index was used. The dive was finished by oxygen decompression.

Results: ECG recording was within norm during the whole simulated dive conditions. Dsf value increased in comparison with normobaric (control) conditions by approximately 11%. There were only slight changes in the microvascular circulation parameters.

Conclusions: Oculographic changes showed that simulated dive to 6 ATA has a significant influence on the central nervous system function (as showed by Dsf index increase). Understanding of changes occurring in the central nervous system is of great importance to safety of diving and work in deep water. Further studies are required for the recognition of changes in perception and psychophysical fitness under the hyperbaric conditions.

CONTENTS OF VITAMINS AND MINERALS IN MENUS USED IN SPORT TRAINING CENTRES

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The aim of the study was to assess the contents of selected minerals and vitamins in menus prepared for athletes staying in the sport training camp.

Methods: Studied were 10 menus, collected from each of the 6 training centres, prepared for athletes representing weight lifting, volleyball, shooting, fencing, rowing and wrestling.

Contents of calcium, phosphorus, magnesium, potassium and iron, as well as vitamins: B₁, B₂, PP and C, were calculated according to recommendations of the National Food and Nutrition Institute, from tables of nutritive value of meals and food products. The data were related to the "recommended intake level" at high physical activity based on the Recommended Dietary Allowances (RDAs) for Poland, as well as to the norms recommended for athletes.

Results: The contents of all minerals and vitamins in the analysed daily food rations were in accordance with the RDAs (Polish norms) and even exceeded them (103 - 377% of norm). However, the supplied quantities of some components were insufficient compared to norms prepared for athletes. It concerned especially vitamins B₁ (40 - 52% of norm) and C (44 - 66% of norm) in all centres, and additionally vitamins A (77% of norm) and PP (86% of norm) in one centre. In case of minerals, too low supply of calcium (74 - 86% of norm) was noted in 3 centres, and of potassium (85% of norm) in one centre.

References

1. Kunachowicz H, Nadolna I, Przygoda B, Iwanow K. Tabele wartości odżywczej produktów spożywczych. IŻŻ, 1998.
2. Nadolna I, Kunachowicz H, Iwanow K. Potrawy skład i wartość odżywcza. IŻŻ, 1994.
3. Nöcker J. Die Ernährung des Sportlers, 3 Auflage, Hofmann-Verlag, Schorndorf bei Stuttgart, 1983.
4. Ziemiański Ś. ed. Normy żywienia człowieka. Fizjologiczne podstawy. PZWL, Warszawa, 2001.

BLOOD ANTIOXIDANT DEFENSE IN FEMALE SOCCER PLAYERS

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The aim of the study was to evaluate the effect of a graded running exercise on the blood antioxidant system in female soccer players.

Material and methods: Twelve female athletes (aged 20.3 ± 4.3 y, body mass 59.2 ± 5.6 kg) from the Sports Club Czarni Sosnowiec volunteered to participate in the study. At the beginning and at the end of a general preparation phase to spring soccer season the players performed a graded running exercise on a treadmill (LE 300C-Jaeger) until volitional fatigue. Venous blood samples were drawn at rest and at 5 min. post exercise. Fresh plasma samples were assayed for activities of creatine kinase (CK) and lactate dehydrogenase (LD) as well as for glucose, uric acid (UA) and ammonia (NH_3) concentrations. Fresh whole blood samples were analyzed for activity of glutathione peroxidase (GPX), reduced glutathione (GSH) and selenium (Se). Activities of superoxide dismutase (SOD), catalase (CAT) and glutathione reductase (GR) were assessed in RBC hemolysates whereas plasma samples were analyzed for vitamin E (-tocopherols), retinol and malondialdehyde (MDA).

Results: In both graded running tests plasma CK and LD activities were higher ($p < 0.05$) post-exercise, similarly substantial post-test ($p < 0.05$) increases were recorded in concentrations of glucose, UA and NH_3 . The response of antioxidant enzymes to exercise-induced oxidative stress was variable, i.e. the activity of SOD decreased ($p < 0.05$) post-test, whereas CAT and GR remained practically unchanged while GPX activity increased ($p < 0.05$). Mean whole blood Se level did not reach the lower limit of the reference range (80 to 250 ng/ml). Glutathione and MDA were found to be higher post-exercise. In the 2nd test performed at the end of the general preparation phase there was a tendency towards lower pre- and post-exercise levels of -tocopherol and lower activities of antioxidant enzymes (SOD, CAT and GR).

Conclusions: A graded running exercise, as applied in the present study, did not result in substantial changes of the blood antioxidant defense system in our subjects. However, a slight worsening of the antioxidant status was recorded at the end of the general preparation phase, mainly due to a decline in -tocopherol and activities of SOD, CAT and GR. Significant exercise-induced increases in MDA, as found in both tests, may suggest that oxidative damage to muscle cell biomembranes might contribute to the enhanced leakage of cell enzymes (CK and LD) into circulation.

THE HEALTH BEHAVIOUR OF ATHLETES

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We are interested in the relation between professional sport and health status. In the last years the protective effect of regular physical activity has become well known. It was reported that training with suitable intensity and frequency as health protective behaviour. It reduces the risk of development of illnesses in adults and has a positive effect on the life quality of patients.

Sport habits of young people influence their lifestyle and health. The more frequent and intensive the training is the more favourable psychological status one gets.

If the origin of the training is part of the risk attitude, physical activity often comes with alcohol and drug consumption.

On the basis of the above mentioned and other research we must ask the following question: what are the health and risk behaviour and the psychosocial health of athletes like? Is there any relation between the gender, age, type of sport activity, success, psychosocial health, the health and risk behaviour of sportsmen?

The study was carried out on professional and amateur ball players (43 males and 58 females).

The subjects completed self-report questionnaires, concerning their health status, psychologic well-being, self-perceived health, psychosomatic findings and risk attitude (smoking, doping, drug and alcohol consumption).

Our results are in agreement with the literature. The psychological well-being and self-perceived health of males are better than those of females. The ball players have less psychosomatic findings than the non-sport participants. The most frequent psychosomatic findings are the same in the group of ball players and in the group of non-sport participants. The ball players did not smoke less and did not consume less alcohol than non-sport participants.

INFLUENCE OF AMINO ACID SUPPLEMENTATION ON BONE METABOLISM DURING BODYBUILDING TRAINING

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Aim of the study: The high intake of dietary protein supplements is very common in young bodybuilders. It is well established that the high protein diet increases the renal excretion of calcium, lead to increase of bone degradation, and risk fracture (1).

On the other hand, resistance exercises have been shown positively influence the bone mass in humans (2). Therefore, the purpose of the present study was to elucidate the effect of free amino acid supplementation on bone metabolism in young men during the bodybuilding training.

Materials and methods: The study was performed on 20 healthy male students aged between 20-25 years, participating in amateur bodybuilding training (average 2.9 ± 1.66 years). Before the study subjects had not performed resistance exercises for 1 month and then participated in a 8-weeks bodybuilding training program (3 days/week). Before the study (term I), after 4 (term II), and 8 weeks (term III) of the training program, biochemical indices of bone metabolism in the blood serum were measured. During the last 4 weeks of the training (from term II to III) a group of 10 men (group I) consumed amino acid hydrolyzate of potato and egg protein - Perfect Amino produced by HI TEC NUTRITION in capsules (1 capsule/10 kg of body mass per day). The supplement was composed of 82.2 g protein, 1.9 g fat and 0.3 g carbohydrates. The other 10 participants (group II) participated in training without any supplements.

Results: Between terms I and II the training led to significant increase of the level of bone synthesis markers: osteocalcin and bone alkaline phosphatase (bALP) from mean 12.6 ± 4.04 ng/ml to 15.8 ± 5.75 ng/ml ($p < 0.01$) and from 26.7 ± 3.05 U/l to 32.8 ± 5.89 U/l ($p < 0.01$), respectively, in the group I and from 13.4 ± 2.97 to 16.2 ± 3.75 ng/ml ($p < 0.05$) and from 20.1 ± 4.77 to 25.1 ± 2.96 U/l ($p < 0.05$), respectively, in the group II. There were no significant changes in concentrations of bone resorption marker – C-terminal telopeptide of collagen I (ICTP) in both groups investigated. During the period between terms II and III there was found significant decrease in osteocalcin level (mean to 12.4 ± 4.05 ng/ml; $p < 0.01$) in the group I. In the group II there were no significant changes in biochemical indices of bone metabolism.

Conclusion: The 4-weeks resistance exercise program led to the increased bone formation. It suggests that adaptive changes of bone metabolism to the bodybuilding training occurred in the early period of the training program. In spite of the positive influence of the resistance exercises on bone metabolism the 4-weeks of amino acid supplementation resulted in decrease of bone formation.

References

1. Kerstetter JE, O'Brien KO, Insogna KL. Low protein intake: the impact on calcium and bone homeostasis in humans. *J Nutr* 2003; 133: S855–S61.
2. Conroy BP, Kraemer WJ, Maresh CM. et al. Bone mineral density in elite junior Olympic weightlifters. *Med Sci Sports Exerc* 1993; 25(10): 1103–9.

OCCURRENCE AND PREVENTION OF CONCUSSION IN SPORTS

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Mild head injury is a frequent occurrence in many sports. A review of sports medicine literature has revealed that, the chances of any athlete incurring mild head trauma are generally between 2% and 10%. However, the incidence of this injury varies from sport to sport, with ranges of the following rates: equestrian, 3% to 91%; boxing, 1% to 70%; rugby, 2% to 25%; soccer, 4% to 22%; and American football, 2% to 20%. Concussion, a mild traumatic brain injury is a common consequence of trauma to the head in contact sports, but it can result from collisions or falls in all forms of athletic activity. Concussion results from the sudden acceleration or deceleration of the brain because of either direct or indirect (e.g. rotational) forces. There are a number of ways of reducing the likelihood and severity of the concussion. All players in contact sports should wear a properly fitting, custom-made mouth-guard. The second means of decreasing the severity of concussion is improved conditioning of the neck musculature. Protective helmets, similar to the padding in boxers gloves also reduce the ultimate force brought to bear in the brain. Rule changes and coaching techniques are next possible ways of reducing the incidence of head injuries. Criteria for return to sport after concussion are very important.

THE INFLUENCE OF OVERHEAT ON THE METABOLISM OF THE LIPIDS OF YOUNG WOMEN CAUSED BY SAUNA BATHS

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The aim of the study was to analyze the basic physiological reactions in the metabolism of lipids in young women who underwent single and repeated sauna baths.

Material and methods: Ten healthy volunteers participated in the experiment. Each participant experienced sauna baths for the first time. Baths were taken for 30 minutes, every second day, always in the morning, and the whole experiment lasted for two weeks. After each sauna session the participants took a cool shower with water temperature approximately 20-21° C. The temperature in the sauna was about 80° C and the humidity about 27%. All physiological measurements were carried out during the first and fourteenth day of the experiment (after and before the first thermal exposition). During these days the subjects were examined on an empty stomach and after bed rest. The heart rate was measured by palpation and the blood pressure by sphygmomanometer. The rectal and tympanic temperature was monitored by electro-thermometer. Body weight was measured before and after the sauna bath. The gases breathed by the subjects were collected into Douglas bags before and during the last three minutes of the bath. The blood was taken from Basilic vein of the forearm in the amount of 10 cm³ ten minutes before and immediately after the sauna bath. To indicate changes in the metabolism of lipids the following factors were measured: total lipids - TL, free fatty acids - FFA, total estrified fatty acids - TFFA, TG, total cholesterol - TC and cholesterol HDLC.

Results: The observations with regard to tympanic and rectal temperature, which were lower in the last sauna bath than in the first one, revealed the adjustment of the human body to the high temperatures. Losses of plasma were greater during the seventh bath than during the first one. Acceleration of the metabolism of lipids occurs after every sauna bath, this is probably as a result of higher hGH, ACTH and cortisol secretion. A reduced level of TC and LDLC and a raised level of HDL was observed after repeated sauna baths.

Conclusions: After 2 weeks of repeated sauna sessions reduction of total cholesterol and concentration of LDLC were observed, while concentration of HDLC increased. Those kinds of changes may be good prognoses of ischaemic heart disease prevention.

EFFECT OF THERMAL DEHYDRATION ON MUSCLE BIOELECTRICAL ACTIVITY (EMG) DURING RUNNING EXERCISE IN MEN

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The aim of this study was to investigate whether heat stress and a consequent heat - induced thermal dehydration influence muscle bioelectrical activity in men performing a 60-min running exercise test at constant velocity.

Methods: Eight healthy, untrained, or acclimated to heat male subjects participated in this study (age 20.75±1.03years, height 177.8±4.16cm, body mass 73.47±5.51kg, $\dot{V}O_2\text{max}$ 52.87 ml·kg⁻¹·min⁻¹. Before the experiment they consumed a normal mixed diet (1). The subjects participated in two tests: ZI, 60-min running test at 50% $\dot{V}O_2\text{max}$ (control group); ZII - similar test as in ZI group performed after thermal dehydration. Both exercises were performed at the thermoneutral environment. Thermal dehydration was induced by acute exposition to heat stress conducted in 3 consecutive 15 min sessions in sauna bath (SA) (2). ZII exercise test was performed after ~90 min recovery period. No fluids were provided to participants during and after sauna.

At rest, before and after sauna, after 90-min resting period, after cessation of the exercise, and 24h after SA blood samples were drawn to determine biochemical and hormonal variables and to measure changes in blood, plasma and cell volumes. During the exercise the surface electromyogram (EMG) was continuously recorded from vastus lateralis (VL) muscle of left and right leg (and stored in 5s/60s intervals). After the test the mean power frequency (MPF) and average amplitude of EMG signals (AEMG) were calculated. Additionally core temperature and skin temperature above VL muscle were continuously measured.

Results: After sauna bath there was reduction of body mass (D-1.42%), a decrease in blood (D-2.97%), plasma (D-4.36%) and cell (D-3.05%) volumes as well as an increase in body temperature (D+2.1 °C) and plasma cortisol level (570.8-741.98nmol/l).

At the beginning of exercise the average EMG amplitude (AEMG) was significantly higher in group ZII (202-163mV) than ZI (60-70mV); afterwards it decreased until 30min of exercise and again increased at the end of the test (until 222mV). In group ZI AEMG did not change significantly during the running test. At the beginning of exercise MPF was significantly higher in group ZI (~68Hz) than in ZII (~40Hz). In ZII group the mean power frequency of EMG showed a slightly increase during exercise (from 40 to 70Hz) until 30 min of the test After 30 min of running in ZII group MPF was shifted to lower frequency (39-52Hz), while in group ZI MPF was unchanged during 50 min of exercise and slightly shifted to lower frequency during 10 last min of the test (50-63Hz)

Conclusions: It was showed, that applied thermal dehydration significantly influences muscle bioelectrical activity (EMG) during the running exercise, increasing initial level of muscle fibre activation (AEMG) and causing typical changes in EMG characteristics at the end of exercise, reflecting the development of muscle fatigue (4).

References

1. Celerowa I. Żywnienie w treningu i walce sportowej. Biblioteka Trenera, Warszawa, 2001.
2. Pokora I, Sieroń AL, Kłapcińska B. et al. Heat stress response (HSR) to exogenous heat load in men. *Mat XIII Symp. Molecular and Physiological aspects of regulatory processes of the organism*, Kraków, 2004: 364–5.
3. Pokora I. Relationships between electromiographic characteristics, mechanical efficiency and body temperatures during running exercise test in men. *Journal of Human Kinetics* (in press 2004).
4. Moritani T, Muro M, Nogata A. Intramuscular and surface electromyogram changes during muscle fatigue. *J Appl Physiol* 1997; 60: 1179–85.

ALTERATIONS IN THE ACTIVITY OF THE ANTIOXIDANT ENZYMES IN BLOOD OF MALE AFTER A GRADED EXERCISE AND LOW-CARBOHYDRATE DIET

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The aim of the study: The study was aimed at the assessment of the effect of a low-carbohydrate diet (L-CHO) and graded exercise on activities of the blood antioxidant enzymes in young men.

Methods: Six healthy physical education students (aged 20,9 years $\pm 0,7$; body weight 75,2 kg $\pm 13,8$; height 179,6cm $\pm 8,6$) volunteered to perform a graded cycle ergometer exercise to volitional fatigue. The same experimental protocol was applied twice i.e.: after 3 days' ingestion of the control (K) mixed diet (59% energy from carbohydrate, 14% from protein and 27% from fat) or isocaloric (L-CHO) low-carbohydrate diet (5% carbohydrate, 43% protein and 52% fat). Before starting a new series of the experiment the subjects performed the graded cycle ergometer exercise in order to decrease the endogenous glycogen stores in lower limbs. In venous blood samples obtained at pre-test, in the last minute of maximal physical effort, after 24h of recovery, the activity was determined of glutathione peroxidase (GSH-Px), superoxide dismutase (SOD), catalase (CAT), glutathione reductase (GR) and in blood plasma samples the level of MDA as a marker of lipid peroxidation.

Results: A 3-day ingestion of a L-CHO diet has no significant effect on resting activities of GSH-Px, SOD and CAT, although a tendency was observed towards higher values after ingestion of this diet. The activities of antioxidant enzymes tended to decrease in the last minute of maximal physical effort, and then to increase after 24h of recovery, to a level slightly higher than that recorded before-exercise. Independent on the kind of the diet, the activity of GR_{FAD+} tended to increase in the last minute of maximal physical effort to reach the maximal values in the 24h of recovery. There was a tendency towards lower values both pre-and post-exercise levels of MDA after consuming a L-CHO diet for 3 days.

Conclusions: A slightly higher activities of GSH-Px, SOD, CAT and lower levels of MDA after L-CHO diet, might evidence a beneficial effect of a L-CHO diet on the blood enzymatic antioxidant defence system in men.

PHYSICAL ACTIVITY, BODY IMAGE AND DIETARY HABITS OF POLISH ADOLESCENTS

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Aim of the study: Investigations indicate that adolescents reported moderate levels of body image dissatisfaction and a significant association of body image dissatisfaction with increased drives for thinness (1). The most common methods selected by Spanish teenagers to lose weight were: increased physical activity or sports participation (more than 68% of population), avoidance of snack meals (66% girls and 23% boys) (2). Lack of this type of study inclined authors to investigate above mentioned problem of physical activity, body image dissatisfaction and eating behaviors in Polish adolescents.

Materials and methods: The study group consisted of 146 adolescents (80 boys, 55 girls) aged 15.9 $\pm$ 0.3 years,

who attended governmental schools with typical amount of gym lessons (which means the level of their physical activity). The research was carried out in 2003. Participants filled out specially prepared questionnaire form. The contour –scale of silhouette proposed by Storz and Green (3) was used in questionnaire investigation of the own silhouette perception.

Results: Adolescents took exercise 2-3 times a week, boys significantly more often ($p < 0.05$) and their training was longer (one training session lasted approximately two hours, $p < 0.0001$). Body dissatisfaction was observed in 75% of the females and in 33% of the males. 48% of the girls perceived fear of putting on weight and only 9% of the boys, and apart that girls accepted their body silhouette, they used slimming diets 9 times more than boys. 47.9% adolescents disagreed with a statement that a very slim body silhouette testifies about undernutrition.

Conclusions: More attention should be paid in the public intervention programs to the range of the dietary health promotion and physical activity in the group of young people being in the juvenescent phase of development.

References

1. Sands R. Reconceptualization of body image and drive for thinness. *Int J Eat Disord* 2000; 28(4): 397–407.
2. Cuadrado C, Carbajal A, Moreiras O. Body perceptions and slimming attitudes reported by Spanish adolescents. *Eur J Clin Nutr* 2000; 54(1): S65–8.
3. Storz NS, Greene WH. Body weight, body image, and perception of fad diets in adolescent girls. *J Nutr Educ* 1983; 15(1): 15–8.

DIET CONTENT OF MARTIAL ART COMPETITORS

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Introduction: Underestimation of nutrients content in sports diet, as well as lack of proper and regular nutrition monitoring is one of the most common defects in the area of sport nutrition.

Aim of the study: was to compare sports diet components content with recommended norms.

Material and methods: The diet of two groups of students - sportsmen (55 persons in the age of 18-22 years) (Greco-Roman wrestling and judo) was investigated. The estimation of meal content was carried out by a method of 3 single 24-hour records. Energy and basic nutrients contents were estimated in daily consumed meals. For analysis of the data computer program FOOD-2 (2002) was used.

Results: Diet content in both groups was characterised by essential differences norms. It was expressed in high fat and low carbohydrates, vitamins and minerals consumption. The results are shown at Table 1.

Conclusions:

1. Important differences were found between recommended diet content and diet applied by investigated sportsmen. It was expressed by to high fat consumption. On other hand carbohydrates, vitamins and minerals intake was to low in comparison with recommendations.
2. In professional sports application of preventive educational programs is important in formation of sportsmen.

REACTIONS OF HORMONES TO TRAINING SESSION IN SWIMMING WITH RESPECT TO SEX AND TRAINING STATUS

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Aim of investigations was to determine plasma aldosterone and renal catecholamine excretions during and after an actual swimming training session. Beside evaluation of training responses a comparison of the results between different sex and performance capacity was performed. With 15 male and 12 female swimmers of different performance capacity an 80 min extensive interval training session including 3500 to 4200 m in front crawl was conducted. Before, at the end and 1.5 and 3 hours after training blood and urine samples were taken for determination of the hormones. Increase of plasma aldosterone concentration (Aldo) induced by swimming was less pronounced compared to equivalent exercise on land. This results from the suppressive effect of immersion to Aldo secretion (1). In males Aldo is increasing significantly from 161 ± 83 to 263 ± 118 pg/ml during swimming training; in females individual change during training are differing impressively. Before training their Aldo was significantly higher than values of the males. This corresponds with the results of Sundsfjord and Aakvaag (2). Only 1.5 hr after end of training session a significant elevation of Aldo was found in females (324 ± 156 to 398 ± 191 pg/ml). In both sexes training-induced changes of Aldo are correlating positively with the performance during training session.

Before and during swimming renal catecholamine excretions display a significant dependence on sex and physical fitness. During training session less trained male subjects are reacting with an increase of catecholamine excretions,

while in females a corresponding augmentation of catecholamine excretion occurred in the well-trained group. These effects were paralleled by changes in blood lactate concentrations. Though noradrenalin/adrenalin-quotient in females generally was significantly greater than in males, the training induced elevation of values was similar in men and in women.

References

1. Skipka W, Boening D, Deck KA, et al. Endocrine Reactions of Athletes and Nonathletes during Immersion. *Pfugers Arch* 1975; 359: 138.
2. Sundsfjord JA, Aakvaag A. Variations in Plasma Aldosterone and Plasma Renin Activity throughout the menstrual cycle. *Acta Endocr (Kbh)* 1973; 73: 499.

DEPENDENCY OF ELECTROPHORETIC MOBILITY OF CELL NUCLEI (EMN) CHANGES ON EXERCISE INTENSITY IN FEMALE ROWERS

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Aim of the study was to study the effect of maximal and supermaximal physical exercises on changes in physicochemical properties of buccal epithelium. These changes were measured using the method of intracellular microelectrophoresis (EMN – Electrophoretic Mobility of Cell Nuclei).

Materials and methods: Senior female rowers (N=10) aged 22.0 SD 2.70 yrs.; with training experience 7.9 SD 3.22 yrs.; body height 174.4 SD 4.97 cm; body mass 69.0 SD 10.49 kg performed exercise tests on rowing ergometer: the first one was of the supermaximal intensity, performed in the shortest time, on a distance 2000m; the second test was of maximal incremental intensity and relied on rowing from starting load of 80W with increasing exercise intensity every 3 min by 30W until achievement of $\dot{V}O_{2\max}$. In both exercises selected physiological parameters were continuously registered by computer set Cardio-Pulmonary-Exercise-D (CPX-D) and heart rate by Sport-Tester PE-3000. In fingertip blood acid-base balance parameters were evaluated and in venous blood samples concentrations of several hormones (insulin, growth hormone, cortisol, estradiol, progesterone, testosterone, prolactin, lutropin and folitropin) were determined. In every senior female rower buccal epithelium from oral cavity was taken out before and after exercise.

Results: After both exercise tests a decrease of EMN index values was noticed. However, in both exercises the changes of electrophoretic mobility of the cell nuclei were statistically in significant tests. The dependency of the phase of menstrual cycle was not observed. However, there was a positive correlation between EMN index and concentrations of growth hormone, testosterone and folitropin and the negative correlation between EMN index and $\dot{V}O_{2\max}$, $\dot{V}O_{2\max}$ predicted for age, maximal power, mean power, and time achieved on a distance of 2000m.

Conclusions: The acidic character and the range of changes in exercise physiological parameters, and also the increase in majority of studied hormone concentrations, induced by physical exercise, were reflected in physicochemical changes of organism's cells. It was shown by statistically significant relations between EMN index and selected hormones, and also by other exercise-induced physiological changes.

References

1. Czapla Z, Cieřlik J. The EMN index as measure of the biological condition of the human organism. *Medical Review, Scripta Periodica* 2000; 3: 24–38.
2. Shakhbazov VG, Colupaeva TV. Determination of the state of human organism by assessment of the electrokinetic properties of cell nuclei. Abstracts of the Conference Problems of Informatics, Moscow, 1991; 86–7.
3. Shckorbatov YG, Colupaeva TV, Shakhbazov VG, Pustovoj PA. O swjazi elektrieskich swojstwa jader kletok celoveka s nekatorymi fizjologiceskimi parametrami. *Fizjologija celoveka* 1995; 21(2): 3–97.
4. Szczepanowska E. Odpowiedzi hormonów glukostatycznych i płciowych na wysiłek fizyczny organizmu człowieka. Monografie AWF w Poznaniu, 2001; nr345.

CONTENTS OF ENERGY AND OF PRINCIPAL FOOD COMPONENTS IN DAILY FOOD RATIONS FOR ATHLETES AT SPORT TRAINING CENTRES

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The aim of the study was to assess the mode of nutrition of athletes staying in the sport training camp.

Studied were 10 menus, collected from each of the 6 training centres, prepared for athletes representing weight lifting, volleyball, shooting, fencing, rowing and wrestling.

Contents of energy, protein, fat and carbohydrates were calculated according to recommendations of the National Food and Nutrition Institute, from tables of nutritive value of meals and food products. The data concerning contents of energy, fat and carbohydrates were related to the "recommended intake level" at high physical activity based on the Recommended Dietary Allowances (RDAs) for Poland, and protein to the norms recommended for athletes.

Mean values of energy content in diets in sport training centres ranged from 3839 to 5685 kcal. Energy content was in accordance with the norms or even exceeded them for most athletes. Energy supply may, therefore, be insufficient for competitors of high body mass (120 - 130 kg). However, self-service canteens existing in most training centres were well supplied and athletes could supplement their energy intake. The daily food rations provided 147 – 201 g of proteins on the average, which was sufficient for all athletes, and exceeded considerable the RDAs for those with low body mass. On the other hand, the menus in most training centres contained too much fat (above 30% of total energy) and too little carbohydrates (below 55% of total energy). Only one centre offered a better, near optimum proportion of protein, fat and carbohydrate.

References

1. Kunachowicz H, Nadolna I, Przygoda B, Iwanow K. Tabele wartości odżywczej produktów spożywczych. IŻŻ, 1998.
2. Nadolna I, Kunachowicz H, Iwanow K. Potrawy skład i wartość odżywcza. IŻŻ, 1994.
3. Ziemiański Ś, red. Normy żywienia człowieka. Fizjologiczne podstawy PZW, Warszawa, 2001.

THE INFLUENCE OF HIGH PROTEIN INTAKE ON EXERCISE METABOLISM OF TWO INTENSITIES; BELOW ANAEROBIC THRESHOLD AND SUPRAMAXIMAL EFFORT

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Introduction: Substrate uptake during physical effort at different intensities has three breakpoints where the metabolism is changed: carbohydrate (CHO) threshold, anaerobic threshold (AT) and PCr threshold. The proportion of fat and CHO utilisation depends on the muscle glycogen level and on the FFA concentration in blood. The metabolic change of the anaerobic threshold is caused by necessity to accelerate ATP production. However, decrease of the ATP production is accompanied with rapid depletion of the glycogen and lactic acid accumulation. Continued increases of exercise intensity causes H⁺ accumulation and depletion of PCr. There are same information's concerning exercise – induced increase of protein utilisation. The aim of ours study was to evaluate the effects of high protein diet on aerobic metabolism during prolonged work and anaerobic metabolism during 30-s Wingate Test.

Materials and methods: Six healthy physical education students (mean age: 22,5 ± 2,3 yr) volunteered for this study. All subjects supplemented their daily diet by protein (1g / kg bum.) during 6 months. All subjects performed three cycloergometric exercise tests with three-days rest period between: the graded test to asses $\dot{V}O_{2max}$, and AT, the 2-h exercise with intensity 45% - 50% $\dot{V}O_{2max}$, and the 30-s Wingate Test. Indirect calorimetry method to measure energy expenditure and substrate uptake was applied during rest and 2-h lasting exercise.

Results and discussion: Our data showed the changes in aerobic metabolism during prolonged exercise and in anaerobic metabolism during supramaximal work after 6-months high protein intake. During submaximal work the distribution of energy from CHO increased by 53,5%, decreased from FAT by 40%, and from protein by 34%. Resting metabolic rate increased also by 14%. During supramaximal work the subjects performed only 2% more work, but contribution of the phosphagenic and glycogenolytic systems in energy yielding were changed. Energy provision from glycogenolysis increased by about 13%. It is interesting that the increase of glycolytic ATP provision coincided with the increase of blood buffering capacity. In conclusion we can suggest that excessive protein intake in healthy athletes not only caused the positive nitrogen balance, but also aerobic and anaerobic metabolism.

References

1. Tipton KD, Wolfe RR. *Int J Sport Nutr Exerc Met* 2001; 11: 109–32.
2. Blomstrand E, Saltin B. *J Physiol* 1999; 514: 293–302.

MOTOR ABILITIES IN YOUNG WOMEN THROUGHOUT THE PHASES OF MENSTRUAL CYCLE

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The aim of this study was to analyse changes in motor abilities in the particular phases of menstrual cycle in young, non-athlete women.

Materials and methods: The study involved 326 first-year women students at Zielona Góra's High Pedagogic School, during the academic year of 1999/2000. Their following motor abilities were tested: strength, agility, jumping ability, power, endurance, quickness and flexibility. The testing had a continuous character and took place on the same day of every second week of each month, over the period of October 1999 – October 2000. The calendar method was used to define the phases (menstrual, follicular, post-ovular).

For each of the abilities, after each of the tests, the basic statistical characteristics were calculated. In order to define the significance of the differences between the increases or decreases in the average values of the abilities in question, single-factor variance analysis was used (which yielded F-Snedecor and smallest difference quotient). To establish the direction of changes taking place over a yearly period, the linear and logarithmic regression methods were used. For grouping (of months or abilities) in order to obtain concentrations sharing similar sets of characteristics, Ward method of concentrations analysis in n-dimensional space was used. Months were grouped using the squares of Euclid distances.

Results and conclusions: The analysis led to the following conclusions:

1. An increased motor efficiency in young, non-athlete women occurs in ovulation and follicular phases.
2. Considerably lower motor efficiency is observed in menstrual phase.
3. The overall picture of all the relations between the values of the motor abilities over the whole menstrual cycle points to two concentrations (within which the values are most alike):
 - a) the values of agility and quickness,
 - b) two sub-concentrations: 1) jumping ability and power connected with endurance and flexibility, 2) strength.
4. The results confirmed the existence of a monthly rhythm of physical efficiency in women.

INFLUENCE OF A MONITORED AEROBIC TRAINING AND A LOW-ENERGY DIET ON SERUM LEPTIN AND INSULIN CONCENTRATION IN OBESE WOMEN

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The aim of the study was to examine the changes of serum leptin and insulin concentration in women during 9-week monitored energy deficit.

Materials and methods: Fifteen women with overweight or obesity were selected to the research. Measurements of body components and leptin and insulin concentration in serum were carried out. Energy deficit was induced by a diet and "fat-burning" type exercises.

Results: Leptin and insulin concentration were significantly higher before (41.9 ± 17.5 ng/ml and 9.6 ± 4.0 ml U/ml respectively) than after accomplishment of experiment (22.1 ± 15.4 ng/ml and 7.3 ± 3.0 ml U/ml respectively). Body mass decreased (BMI from 31.1 ± 3.9 to 28.1 ± 2.9), which was mainly due to a drop in body fat (from 33.1 ± 9.9 kg to 25.8 ± 8.1 kg). All changes have been statistically significant at the level of $p < 0.001$.

In conclusion, 9-week of a monitored aerobic training and a low-energy diet had significant influence on leptin and insulin concentration in women.

References

1. Havel PJ, Kasim-Karakas S, Mueller W. et al. Relationship of plasma leptin to plasma insulin and adiposity in normal weight and overweight women: effects of dietary fat content and sustained weight loss. *J Clin Endocrinol Metab* 1996; 81: 4406–13.
2. Kraemer RR, Kraemer GR, Acevedo EO. et al. Effect of aerobic exercise on serum leptin levels in obese women. *Eur J Appl Physiol* 1999; 80:154–8.
3. Thong FSL, Mclean C, Graham TE. Plasma leptin in female athletes: relationship with body fat, reproductive, nutritional and endocrine factors. *J Appl Physiol* 2000; 88: 2037–44.

INFLUENCE OF PHYSICAL EXERCISE ON EXCRETION OF HYDROXYPROLINE AND NITROGENOUS BODIES' IN SPORTSMEN

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Introduction: It is known that in the state of intensive metabolism in the organism, e.g. in hyperthyroidism, excrete of hydroxyproline in urine raises due to intensive decomposition of collagen effected by excess of the thyroid hormones hyperthyrosis. It is also well known that physical exercise produces and aminoaciduria changes of blood amino acid level and aminoaciduria. Therefore it seemed justifiable to undertake initial investigations referring to hydroxyproline and some nitrogenous bodies' excretion in urine in the context of physical exercise being a base for collagen metabolism in sportsmen where physical exercise may influence this metabolism since this issue has not been taken into account in the researches yet.

Materials and methods: The investigations were carried out on 10 judo experts, 20 canoeists (men and women) with a load of maximal exercise (until refusal) on a bicycle ergo meter Monark. The determination of hydroxyproline (free and complete) and some nitrogenous bodies (amino-nitrogen, urea, creatinine and uric acid) in urine in the subjects was measured before the exercise test (resting state), just after the test (exercise state) and 3 min. after the test was completed (rest state). Urine sampling and its volume determination took place before the exercise test, after the test was completed and after a 30-min-rest. To determine hydroxyproline a "Hypronosticon" test by Organom was applied, calorimetric determination of amino-nitrogen was measured by nihidine test and urea, creatinine and uric acid by chemical auto analyzer –Technicon.

Results and conclusions: The investigation results revealed a significant raise of hydroxyproline in a time unit compared with a resting state and its decrease after the rest state. In the exercise state a significant increase of amino acid nitrogen excretion, thus aminoaciduria was observed to lower its level after rest, even below its pre-exercise values. Also the level of excretion of other nitrogen substances (urea, creatinine, uric acids) indicated a high increase in the exercise state and the evident decrease, even below its pre-exercise values, in post exercise regeneration. Thus it seems that the exercise stimulates collagen and intensifies protein metabolism.

LIMITATIONS OF MAXIMAL ENERGY EXPENDITURE – COMPARISON BETWEEN TRAINED AND UNTRAINED SUBJECTS

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Introduction: The question about the limit of maximal energy turnover is still open. Some researches observed that the maximal energy turnover can increase to the level 20x basic metabolic rate (BMR) and there are some papers, which demonstrated maintenance the energy turnover at 3,5-5,5 x BMR for longer than 3 weeks. We know that physical training enhanced the capacity of energy turnover but we do not know what are the important limitations. It is known that the main source of energy during exercise above anaerobic threshold (AT) is oxidation of carbohydrates but is not clear the influence of different mode of training on maximal turnover of energy expenditure.

The aim of this investigation was to:

- determinate the limit of the maximal turnover of energy expenditure in trained and untrained men: students-volunteers of physical education (n=19), resistance trained (n=8) and sprint trained (n=7);
- determinate limitations in maintenance of maximal energy expenditure;
- find out correlation between rest and maximal energy expenditure.

Materials and methods: Energy expenditure was measured using indirect calorimetric method based on: VO_2 , VCO_2 , rate of nitrogen excretion and RQ, supplemented by blood pO_2 , pCO_2 , pH and hemoglobin concentration. The maximal energy expenditure was measured during incremental cycling until exhaustion.

Results: The amount of energy expenditure increased in relation to resting energy expenditure: 9 times in untrained group, 8 in resistance and 11 times in sprint trained subjects. The maximal turnover of energy expenditure was achieved 13,6 x BMR (basic metabolic rate) in untrained group. The specialistic training changed the limit of maximal energy expenditure to 17,3 x BMR in resistance group and to 16,5 x BMR in sprint trained. We observed higher (21%) carbohydrate utilization in sprint trained group than in resistance group. Only in trained groups we observed the correlation ($r=0,58^{**}$) between amount of carbohydrate utilization in rest and during maximal exercise.

Conclusion: The specialistic training changes maximal turnover of energy expenditure. The kind of diet and muscle mass could be factors limiting the maximal energy turnover.

References

1. Westerterp KR, Saris WHM. Limits of energy turnover in relation to physical performance, achievement of energy balance on a daily basis. In: Williams C, Devlin JT, eds. Food, Nutrition and Sports Performance, EFN Spon, London, 1992: 1–18.
2. McConell GK, Canny BJ, Daddo MC. et al. Effect of carbohydrate ingestion on glucose kinetics and muscle metabolism during intense endurance exercise. *J Appl Physiol* 2000; 89: 1690–8.

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